B. Metallurgical Engineering, 4thYr. 2nd Sem. Examination, 2022

X- Ray Diffraction and Electron microscopy

Time: Four hours   Full Marks: 70

Answer Question No. 1 and any three questions from the following. (Answer all parts of a question sequentially in a common place)

1. Define a pole, trace of a pole, great circle, small circle, planes of a zone and zone axis.

10

2. a) State the differences between Diffraction and Reflection.

   b) State Moseley's Law.

   c) Draw energy level diagram of an atom to show the excitation processes and develop an expression for λ (K_α) radiation.   20

3. What is Diffraction? Derive Bragg's Law. What is non ideal Diffraction? Derive Scherrer's Formula and calculate the particle size.   20

4.a) Calculate the values of 2θ and (hkl) for the first three lines (those of lowest θ values) of the powder patterns of substances with the following structures, the incident radiation is Cu Kα,

   i)   simple cubic (a = 3.2A°)
   ii)   simple face centred cubic (a=3.2 A°)
   iii)   simple tetragonal (a= 2A°, c=3.2A°)   20

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5. a) What is reciprocal lattice? State its properties and prove them. Apply RL concept to Powder diffraction pattern and explain the importance of sphere of reflection, limiting sphere and calculate the total number of reflections.   20

6. Describe the following applications of X-Rays.

a) Retained austenite estimation in a hardened and quenched steel.

b) Solvus curve determination.   20